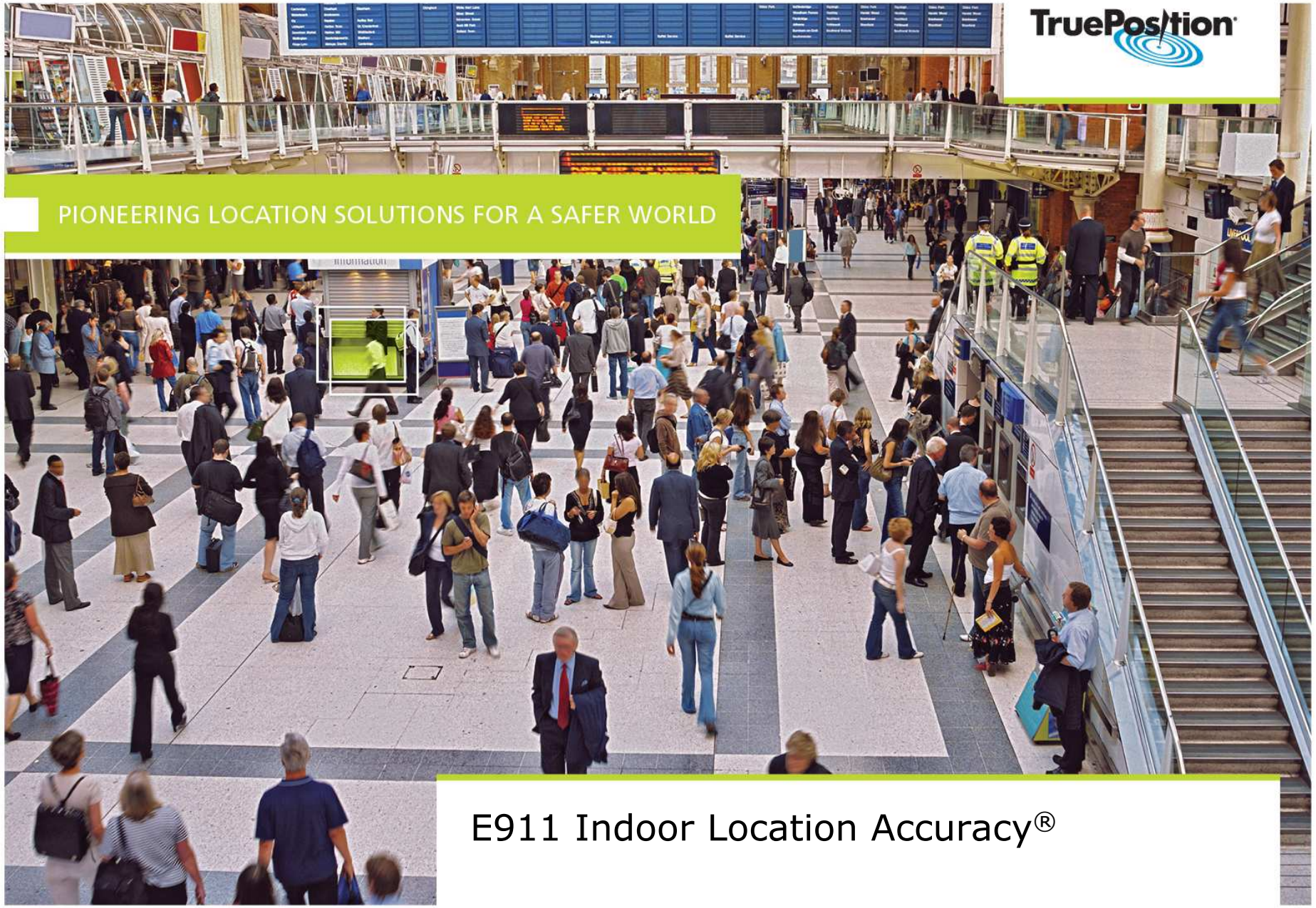
TruePosition

PIONEERING LOCATION SOLUTIONS FOR A SAFER WORLD



E911 Indoor Location Accuracy®

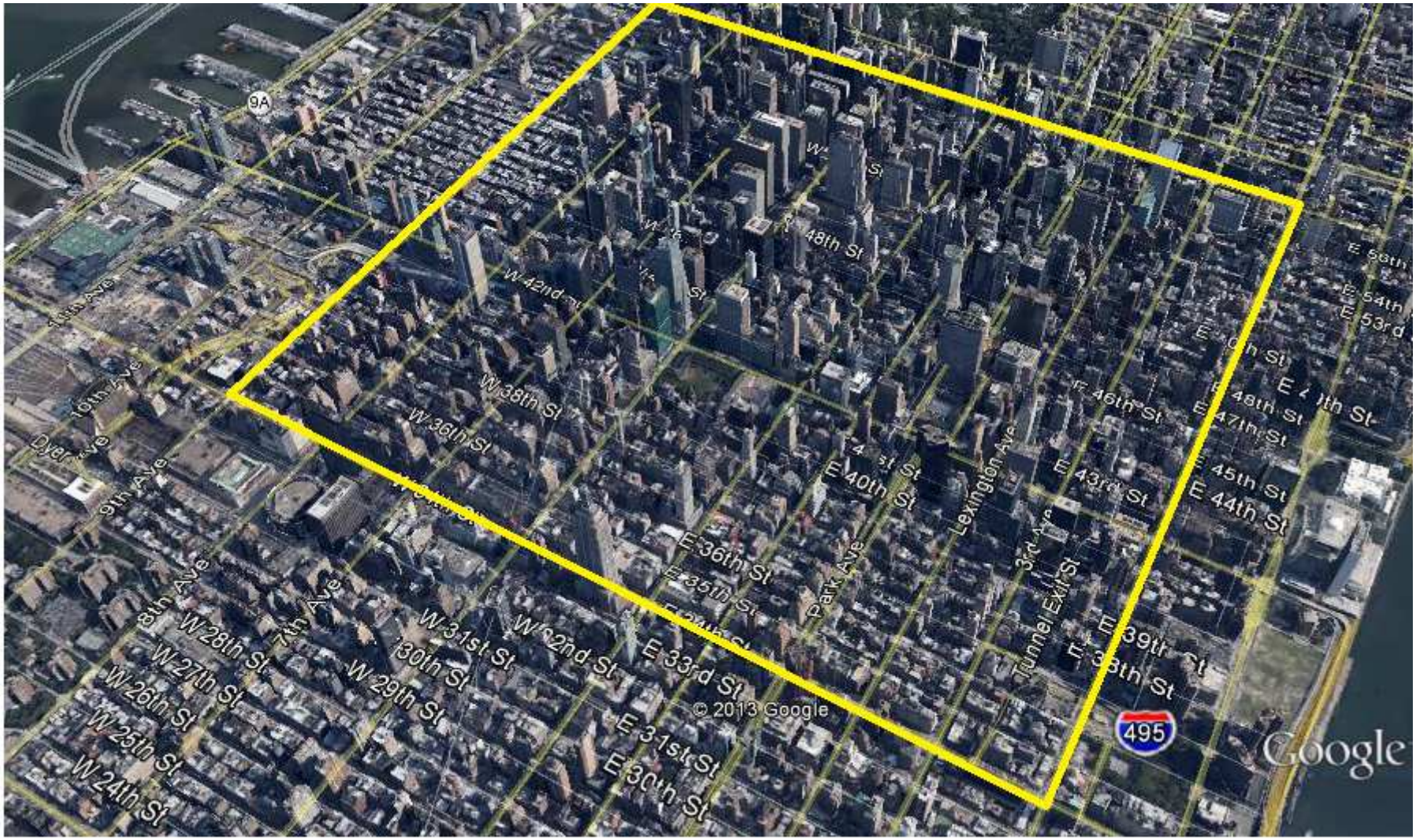
Agenda

- Independent testing of indoor location performance
- Indoor Testing Results
- Comparison testing in Austin and Frisco TX

Manhattan Testing

- Conducted fall of 2000
- Tested TruePosition U-TDOA technology, same technology operating today
- Test conducted on Verizon network in mid town Manhattan by independent Verizon Labs
- Followed methodology equivalent to CSRIC test plan
- Dense urban area – similar to dense urban area in San Francisco
- Many story concrete, steel, glass buildings

Manhattan Test Area



CSRIC Testing – San Francisco

- Conducted 4Q2012 by TechnoCom
- Included indoor testing in dense urban, urban, suburban and rural areas.
- 3 technologies tested
  - NextNav beacon based solution
    - Network of location beacons
    - Receiver in handset to measure beacon signals
  - Polaris Wireless Location Signatures
    - Based on power measurements from the handset
  - Qualcomm AGPS + AFLT
    - Used today for E911

Technocom Testing Wilmington DE

- Conducted 1Q2013 by TechnoCom
- Use CSRIC test methodology
- Included indoor testing in, urban, suburban and rural areas.
- Test U-TDOA + AGPS hybrid.

Indoor Testing Summary

Accuracy and Yield Comparison Dense Urban

- Based on CSRIC testing in San Francisco, and Verizon testing in Manhattan

	67%	90%	95%	Yield
NextNav	57.1	102.4	154	93.90%
Polaris	116.7	400.1	569.3	99.40%
Qualcomm	155.8	267.5	328.1	85.80%
TruePosition	92	150	165	99%

- NextNav and TruePosition had good accuracy
- Polaris and TruePosition had good yield

Accuracy and Yield Comparison

- Based on CSRIC testing in San Francisco and TechnoCom testing with CSRIC based plan in Wilmington
- Urban Comparison

	67%	90%	95%	Yield
NextNav	62.8	141.1	196.1	95.40%
Polaris	198.4	447.8	729.9	99.90%
Qualcomm	226.8	449.3	507.1	90.80%
TruePosition	87.3	140.7	163.2	100

- NextNav and TruePosition had good accuracy, but NextNav had several failed attempts which were not included in accuracy results
- Polaris and TruePosition had good yield

Accuracy and Yield Comparison Suburban

	67%	90%	95%	Yield
NextNav	28.6	52.9	62.2	100.00%
Polaris	232.1	420.7	571.4	99.80%
Qualcomm	75.1	204.8	295.7	91.40%
TruePosition	66.1	116.2	163	100

- NextNav and TruePosition had good accuracy and yield
- Polaris has very poor accuracy
- Qualcomm fails a significant portion of attempts

PSAP Testing in Frisco and Austin, TX

Test Methodology

- Goal: Test real world accuracy of Current E911 deployed Technologies

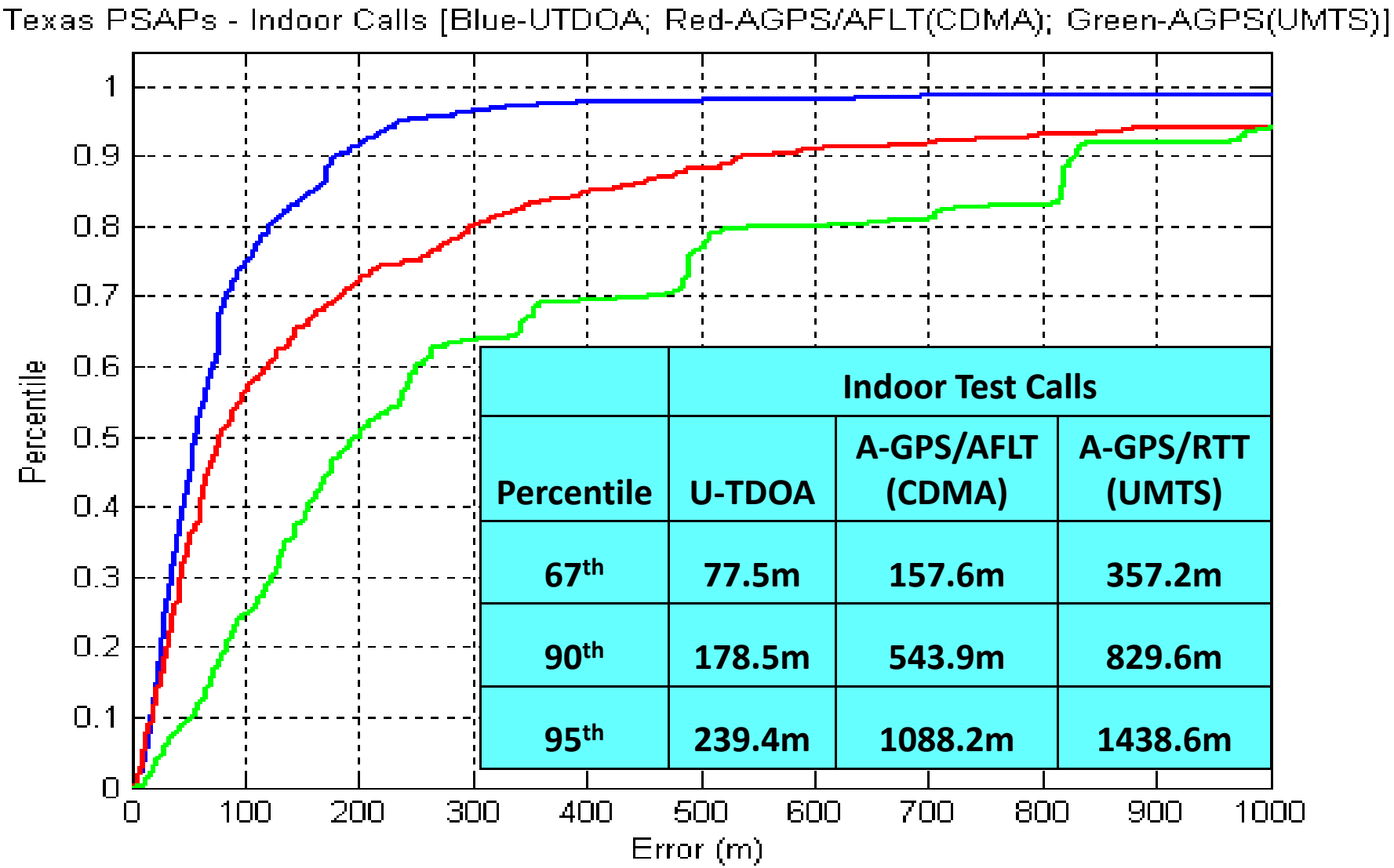
- Parameters:
  - Off-the-shelf phones
  - Three air interfaces - Three location technologies
    - U-TDOA on GSM
    - A-GPS/AFLT on CDMA
    - A-GPS/RTT on UMTS
  - Conducted Fall 2010

- Real world testing conducted in two PSAP areas of Texas
  - Frisco: Suburban
  - Austin: Urban, campus (U of Texas)

Test Methodology

- Over 3500 real 911 calls made to local PSAPs
  - At least ten calls from each test point
  - At least three iterations of calls at each test point
  - Concrete, steel, glass buildings for indoor testing
  - Suburban area of Frisco and Downtown Austin-University of Texas Campus
- Test point selection
  - Both indoor and outdoor test points
  - Chosen test points around city provide reasonable representation of subscriber use
  - Ground truth determined prior to test execution.
- Daily export of PSAP database allowed post-processing to determine error of each test call at each point

Indoor Results - Current E911 Technologies



	Indoor Test Calls		
Percentile	U-TDOA	A-GPS/AFLT (CDMA)	A-GPS/RTT (UMTS)
67th	77.5m	157.6m	357.2m
90th	178.5m	543.9m	829.6m
95th	239.4m	1088.2m	1438.6m

Summary

- Location technologies deployed today can reliably and accurately locate E911 calls from indoor locations
- Wireless operators are increasingly relying on GPS based solutions, such as AGPS + AFLT and AGPS + RTT, which do not work indoors
- The FCC now has enough information about indoor location technologies to move forward to solve the increasing problem of inadequate indoor location coverage